ing often to a thousandth of the entire weight of the plant, while no traces could be detected in the plant which had remained in the air during the same time. In this connection we should mention a detailed account in the *Journal für Prakt. Chemie*, of experiments instituted by Prof. Gunning, of Amsterdam, to settle the question of the ability of bacteria to exist in media free from oxygen. They consisted in inclosing in glass tubes easily decomposable substances, such as raw flesh, green peas, &c., infecting with a drop of a mixture of decayed peas and white of egg, which contains nearly all varieties of bacteria, —closing the tubes by fusion after freeing entirely from oxygen, and allowing to stand for periods ranging from four months to two years. The results of all these experiments showed that by exclusion of oxygen the bacteria were completely destroyed, the putrefaction being entirely stopped, and not continuing afterward, on the admission of filtered air free from bacteria.

THE appearance of phylloxera at Sachsenhausen, near Frankfort-on-the-Main, is officially reported. The appearance of the Colorado beetle at Jaratschewo in the district of Schrimm in the Prussian province of Posen is also reported.

AT Oderberg, in Austrian Silesia, we learn from a report to the Imper. Geol. Instit., March 19, some pile-structures, or rather the floors associated with them, were found in digging for the foundations of gas-works. Two rows of parallel, horizontal oak stems, 60 to 90 centimetres thick, 3½ metres apart, were met with. They were covered with peat, and a quantity of hazel nuts and seed of cereals lay under the peat. At 3 metres deeper more hard wood was found.

PROF. A. M. MAYER asks us to make the following corrections in his article on "Floating Magnets" in NATURE for July 4 (vol. xviii.) :—On p. 258, 2nd col., line 13 from bottom, delete the sentence beginning "This is the only instance," &c. On p. 258, 2nd col., line 11 from bottom, for "This nucleus of 20 cannot be formed without the circumposed magnets as in Fig. 20," read "This nucleus can be formed without the circumposed magnets." On p. 259, 2nd col., line 11 from top, for "1*a*" read "8*a*."

THE additions to the Zoological Society's Gardens during the past week include a White-lipped Peccary (*Dicotyles labiatus*) from South America, a Golden Agouti (*Dasyprocta aguti*) from Guiana, presented by Mr. G. H. Hawtayne, C.M.Z.S.; a Bonnet Monkey (*Macacus radiatus*) from India, presented by Capt. Clarke; a Cape Bucephalus (*Bucephalus capensis*) from South Africa, eleven Spinose Lizards (*Agama colonorum*) from North-West Africa, received in exchange; a Common Marmoset (*Hapale jacchus*) from South-East Brazil, a Grey Parrot (*Psittacus erithecus*) from West Africa, deposited; a Red Deer (*Cervus elaphus*) born in the Gardens.

THE BRITISH ASSOCIATION

REPORTS.

Report of the Committee on Mathematical Tables.—Mr. James Glaisher has undertaken the calculation of the factor tables for the fourth, fifth, and sixth millions, similar to Burckhardt's and Dase's. Burckhardt's tables (Paris, 1814–1817) contain the least factor of every number not divisible by 2, 3, or 5, from unity to three millions, and Dase's tables (Hamburg, 1862–1865) give similar information for the seventh, eighth, and ninth millions. Dase undertook the calculation at the suggestion of Gauss, who urged him to begin at 6,000,000, as the three millions between 3,000,000 and 6,000,000 had been calculated by Crelle and presented to the Berlin Academy, and Gauss did not doubt that they would be published sooner or later. It appears, however, that the Berlin manuscript is too inaccurate to admit of publication, and therefore, in order to fill up the gap, it is necessary to undertake the calculation again, as the nature of the work is such that errors committed do not readily admit of discovery and correction. Mr. Glaisher has completed the portion from 3,000,000 to 4,039,500, which is ready for press, and the remaining two millions are being actively proceeded with.

Report of the Committee on Oscillation Frequencies of the Rays of the Solar Spectrum.—Mr. G. J. Stoney explained the objects of the Committee, and stated that in the table now published the oscillation frequencies of the principal rays of the visible part of the solar spectrum have been computed from Angström's determinations of their wave-lengths in air, combined with Ketteler's observations on the dispersion of air. Such a table and its accompanying map afford the most assistance that can be given towards the detection of harmonic relations, for rays that are harmonically related are therein represented in the simplest form practicable; in the table by an arithmetical series of the same type as the series of natural numbers, where the common difference is equal to the first term; and on the map by a series of equidistant lines.

Report of the Committee on Luminous Meteors.—Mr. James Glaisher read this report, which consisted of (1) an account of meteors doubly observed, with a table showing their real paths, velocities, and radiant points; (2) a detailed account of large meteors; (3) general directions and instructions to observers for recording meteors and aërolites, by Prof. A. S. Herschel; (4) the discussion of a meteor of short period (viz., the fireball of November 27, 1877, for which a short period, such as, say, 500 days, is found), by Capt. G. L. Tupman; (5) an elaborate analysis of the constituents of masses of meteoric iron and stone-falls, by Dr. W. Flight.

Report of the Committee on Underground Temperature.—Prof. J. D. Everett read this report. The principal novelty was the proposal to make observations in filled up bores by a thermo-electric method. Two wires, one of iron and the other of copper, each covered with gutta-percha, were to be joined at both ends, where a portion would be left uncovered. One junction would be buried in the bore, while the other would remain above ground available for observation. A current would flow through the circuit composed of these two wires whenever the two junctions were at unequal temperatures, and the observer would immerse the accessible junction in a basin of water containing a thermometer, and would regulate the temperature of the water until he found by a galvanometer that no current passed. He would then know that the temperature of the water as indicated by the thermometer was the same as that of the buried junction.

SECTION A.—MATHEMATICAL AND PHYSICAL.

Researches made at Dunsink on the Annual Parallax of Stars, by Prof. R. S. Ball.—The author stated that it was, of course, well known that up to the present time no parallax of a star had been detected which exceeded a single second of arc. In the great majority of cases the parallax was very much less, even if it was appreciable. But when they reflected that not one star out of ten thousand had yet been regularly examined for parallax it was obvious that it would be rash to conclude that there were no stars nearer to us than those of which the distance was already known. In selecting objects for investigation of annual parallax astronomers had generally chosen those stars which were exceptional either on account of their brilliancy or the largeness of their proper motions. Either of these features in a star afforded, doubtless, a *primâ facie* presumption that the star was comparatively near the earth. On the other hand, even Sirius had, according to Gylden, a parallax of only one-fifth of a second, while for another star, which had the enormous proper motion of seven seconds annually, Brunnow had found a parallax not greater than one-tenth of a second. The presumptions of nearness founded on great brilliancy or great proper motion, except, perhaps, in the case of 61 Cygni, could hardly be said to be justified by the results of observation. There was, however, a presumption that some of the red stars might be near the earth, and that some of the variable stars were really small, and therefore, as they were visible, comparatively near us. Before commencing the observations described and tabulated in the paper a working list was formed, containing red stars, variable stars, stars with large proper motions, and several other stars which were chosen on different grounds. The observations had the special object of seeing whether any of them had a large parallax. Forty-two different objects had been selected from this working-list, but in almost every case the observations con-

vinced him that the parallax was certainly less than one second, and most probably did not exceed half a second. It would therefore be understood that the results were purely negative so far as the immediate object in view was concerned, as they did not suggest the existence of any parallax worth following up. The principle upon which the reconnoitring observations were conducted was this :—The effect of annual parallax upon a star was to make the apparent place of the star describe a minute ellipse, of which the mean place of the star occupied the centre. The star was observed twice. At the first observation the star was at or near one of the extremities of the major axis of the ellipse; at the second observation it was at the other extremity —so that the observations were so arranged that in each case parallax would have the greatest effect it was capable of producing.

Lord Rosse gave a *Description of an Equatorial Mounting for a Three-Foot Reflector*.—The optical arrangements of the telescope recently erected at Parsonstown was exactly similar to that of previous telescopes, and it was only the mounting which was different. The wooden tube, however, which was formerly formed of staves, had been replaced by an iron tube, which was constructed after designs by Mr. Bindon Stoney. The leading peculiarities of the mounting were that the points of reversal were situated at the east and west instead of at the north and south. The bearings on which the instrument turned in right ascension were smaller than in the ordinary mountings. The motions in declination and in right ascension were effected by means of screws, so that on a windy night the instrument could not run away with the observer. The tube was square; the clock was connected with a strap, and the counterpoise was less than usual. The cage for the observer was independent of the mounting, moving on a circular rail, and with a second motion like that of a derrick crane. The only reflector of a similar size mounted equatorially was that constructed by Mr. Grubb for the Melbourne Government. Lord Rosse illustrated his explanation by means of models of his own and of the Melbourne reflector.

On the Stanhope "Demonstrator" or Logical Machine, by R. Harley, F.R.S.—Towards the close of the last century a logical instrument was constructed by Charles, third Earl of Stanhope. The present Earl found the instrument and some fragmentary papers on logic among the relics of his ancestor, and at the suggestion of Mr. Spottiswoode, placed them in the hands of Mr. Harley, who has made a careful study of them. Earl Stanhope (born 1753, died 1816) is known to science chiefly by his printing press, microscopic lens, arithmetical machine, the monochord, and steamboat. But of his logical speculations, which occupied his thoughts for thirty years, and of his curious contrivance for working logical problems, called by him the demonstrator, nothing has been known. The author did not attempt to give a complete or systematic exposition of the Earl's logical system; but he brought out those points which serve to illustrate the demonstrator as a means of performing logical inference. He noticed that Stanhope anticipated George Bentham, Sir W. Hamilton, George Boole, and others in the quantification of the predicate, and notably De Morgan's rule for the numerically definite syllogism. Stanhope states the rule as applicable to all syllogistic reasoning, and he constructed his demonstrator for the mechanical working of this rule.

On Edmunds' Electrical Phonoscope, by W. Ladd.—This is an instrument for producing figures of light from vibrations of sound. It consists essentially of three parts—an induction coil, an interrupter, and a rotary vacuum tube.

The action of the instrument is as follows :—Sounds from the voice or other sources produce vibrations on the diaphragm of the interrupter, which, being in the primary circuit of the induction coil, induce at each interruption a current in the secondary coil, similar to the action of a contact breaker, or rheotome; therefore each vibration is made visible as a flash in the vacuum tube.

The tube revolving all the time at a constant speed, the flashes produce a symmetrical figure, as the spokes of a wheel, as in the Gassiot's star.

The number of spokes or radii are according to the number of vibrations in the interrupter during a revolution of the tube, and the number of vibrations being varied to any extent according to the sounds produced, the figures in the revolving tube will be varied accordingly.

The same sounds always produce the same figures, providing the revolutions be constant. In case of rhythmical interruptions being produced in a given sound, as in a trill, most beautiful effects are noticeable, owing to the omission of certain radii in regular positions in the figure.

The uses of this instrument are the rendering visible of sounds and showing the vibrations required in their production, and is a mode of confirming by sight an appeal to the ear.

The phonoscope is the invention of Mr. Edmunds, partner in the firm of Ladd and Co., London, by whom it is manufactured.

On Byrne's Battery, by W. Ladd.—This is the invention of Dr. Byrne, of Brooklyn, U.S.A.—The chief features in this battery are a compound negative plate and a simple mechanical means for preventing polarisation.

The negative plate consists of the extreme negative element, platinum, backed up by a plate of copper to reduce the resistance, the copper being protected by a thin sheet of lead to prevent any local action that might occur owing to holes in the platinum, which might allow the exciting fluid to attack the copper, and a thicker sheet of lead on the back of the copper, which is japanned; so a plate in section would show as consisting of, first, a sheet of platinum, then thin lead, then copper, and last by the thick japanned lead, the whole being soldered together to form a solid plate. The batteries are built up with a zinc plate and two of the compound plates, the exciting fluid being a bichromate of potash and dilute sulphuric acid solution.

This battery would soon become polarised but for the injection of air between the plates, which action appears simply mechanical and not chemical, various gases producing no different effects.

When the air is pumped in the most extraordinary effects may be produced, the quantity being enormous, being more than double that of any other battery of the same size. It is much used in the States for surgical operations, its extreme portability and control rendering it peculiarly useful in this direction. The platinum loop can be raised to any temperature and kept at the same simply by the action of the foot on the bellows, leaving both hands at liberty for operating, there also being an entire absence of fumes or other disagreeable smells.

A battery of four small cells will heat nine inches of No. 16 platinum wire to redness.

There is also another form of this battery in which the platinum is platinised: the exciting solution is composed of one part sulphuric acid to ten of water. In this form no air is required to be pumped through the solution. This is used as a motor battery for driving sewing-machines. The inventor states he has driven a heavy Singer sewing-machine for eight hours a day at a cost of twopence, including everything. As yet nothing has been done in this direction in England.

Dr. Janssen gave an account of his method of solar photography, and exhibited some beautiful photographs of the sun, and Mr. G. J. Stoney explained his spectroscope of very large aperture. Mr. J. R. Wigham explained the quadriform group flashing gas light, as used at Galley Head Lighthouse, with illustrations, and also a gas gun, which might be fixed on a rock in the sea at a considerable distance from a lighthouse or a fog-signal station, and fired as often as required from the station, without the keeper leaving his post: a gas gun was placed in the college grounds, and was several times fired from the table of the room in which the section met. Prof. Haughton gave an account of his investigations on the sun heat received at the several latitudes of the earth, taking account of the absorption of heat by the atmosphere, and of his conclusions therefrom with regard to geological time.

The section was divided into two departments on the Monday and Tuesday. There were twenty-two mathematical communications which were read in the department of mathematics, including papers by Mr. Spottiswoode *On the Eighteen Co-ordinates of a Conic in Space;* by Prof. H. J. S. Smith, *On the Modular Curves;* by Prof. R. S. Ball, *On the Principal Screws of Inertia of a Free or Constrained Rigid Body;* by H. M. Jeffery, *On Cubic Curves;* by Mr. J. W. L. Glaisher, *On Certain Special Enumerations of Primes*, and *On Circulating Decimals;* by Mr. F. Purser, *On the Geometrical Treatment of Bi-circular Quartics;* and by Dr. Hirst *On Halphen's New Form of Chasles's Theorem on Systems of Conics satisfying Four Conditions.*

SECTION C.—GEOLOGY.

On the Influence of Strike on the Physical Features of Ireland, by Edward T. Hardman, F.C.S., Geological Survey of Ireland. —Although not often mentioned in geological works, the in-

fluence of strike in determining the lines of direction of the principal physical features of a country, is recognised by most geologists, but in few countries is the relation so distinct as in Ireland. The author was led to pay attention to this subject some years ago on reading Mr. J. F. Campbell's paper on the glaciation of Ireland,[1] in which that gentleman assumes that the south-west and north-east trend of some of the mountains of Ireland, *e.g.*, those of Donegal and Kerry, is due to the glacial action of a huge ice-sheet passing over Ireland from the south-west of Scotland. The author, after some years' examination, has found, however, that in most cases the trend of the hills, and course of rivers, &c., are determined by the strike alone, and wished to place the facts he had noted before the section.

1. *Mountains.*—The Donegal highlands trend to the south-west along the line of strike of the ancient crystalline stratified rocks. The basaltic plateau of Antrim follows in outline the windings of the outcrop of the underlying chalk, and consequently the strike of the basalt itself upheaved with it. The Mourne Mountains and Slieve Croob also coincide in direction with the stratified rocks on their flanks, except where joints or faults have given rise to minor lateral valleys, *e.g.*, Carlingford Lough. The same adherence to the line of strike is seen in the hills forming the flanks of the Wicklow Mountains; in the Kilkenny and Tipperary coal-fields; the Comeragh and Knockmealdown Mountains; and is most remarkably shown in that series of flexured carboniferous and old red sandstone rocks forming the hills of Cork and the Mountains of Kerry, the axes of which stretch from Dungarvan (co. Waterford) to Cape Clear, and Bantry Bay. The Reeks of Kerry are good examples. Its influence is again shown in the shaping of the high ground forming the Munster coal-field, and finally in the mountainous district of Connemara, although here in places obscured by the action of faults. The Twelve Pins, Muilrea, the mountains flanking Killary Harbour, and the country northwards around Nephin Mountain are striking examples. Toward the central plain the isolated mountains of old red sandstone and Silurian rocks rising through the carboniferous limestone, viz., the Slieve Bloom Mountains, the Devil's Bit, and the Galtees, conform to the same rule, the axis of strike and direction being parallel.

2. *Rivers.*—In the south of Ireland especially many of the rivers follow the windings of the strike. The Suir follows the line of strike for eighty miles, only beginning to cross it about ten miles from the sea. The Blackwater runs along the strike for seventy miles of its course, crossing it for only sixteen miles. The Lee is directed by the strike for fifty miles of its length, as is also the Bandon River for the greater part of its course, while the Shannon may be traced along the strike of the beds for by far its greatest distance.

3. *Inland Lakes.*—Most of the lakes are conformable to the strike in their greater outlines, the smaller details being determined by the jointage. Of these may be mentioned Lough Neagh, Loughs Corrib and Mask, Lough Erne—most notably—Lough Allen, Lough Derg, and the far-famed Lakes of Killarney.

4. *Sea Lochs, Bays, &c.*—The majority of these may be included—Lough Foyle, Belfast Lough, Strangford Lough, Lough Larne. The most notable examples are those on the south-west. Roaring Water Bay, Dunmanus Harbour, Bantry Bay, Kenmare River, and Dingle Bay. Also the mouth of the Shannon, Galway Bay, and Clew Bay. Farther north, the principal bays and indentations along the line of coast stretching from Broadhaven to Donegal; Killala Bay, Sligo Bay, and Donegal Bay, have been excavated in their great outlines along lines of strike.

In conclusion, the author pointed out that nature had adopted the least expensive method of working; since it is always easier to excavate along a line of strike than across the bedding. Usually cleavage, or incipient cleavage, is induced along the line of strike by the forces which upheaved the rocks, and denudation is most early effected therefore in this direction.

On the Correlation of Lines of Direction on the Globe, by Prof. O'Reilly, M.R.I.A.—The theory of correlation of the great lines of direction on the earth's surface had long been studied and applied, especially in mining; and had been generalised by Elie de Beaumont, and applied by him to the correlation of mountain chains with remarkable results, but his theory had found but little favour with English geologists. The author having been led to examine the question, based his system on angular relations actually observable in certain rocks, and in these he had found the angles 40° and 70° to bear a very important part. He gave details tending to show the relation of those angles to the main lines of direction on the surface of the globe, taking as a base line the east coast of Madagascar.

On Hullite, a hitherto Undescribed Mineral from Carnmoney Hill, Co. Antrim, with Analysis, by Edward T. Hardman, F.C.S.—This mineral occurs in abundance at Carnmoney Hill, near Belfast, in the basalt forming the old neck of a miocene volcano. It has never before been described or analysed, and has been referred to on the Survey maps and in the Survey collections as obsidian, doubtless from its black colour and waxy lustre. In physical character it somewhat resembles the chlorophæite of Macculloch, but is entirely different in composition, which more resembles that of delessite. From this, however, it differs essentially in colour, hardness, and specific gravity, but it appears to belong, on the whole, to the ferruginous chlorite group.

Physical Characters.—Colour, black; hardness, about 2; lustre, waxy, but dull; before blowpipe, with difficulty fusible at edges to a black glass sometimes magnetic; very slightly affected by strong acids in the mass, but nearly entirely decomposed when boiled in powder, in strong hydrochloric acid, occurs filling and coating vesicular cavities in basalt of Carnmoney Hill, &c.

Chemical Composition.

Silica	39·43
Alumina	10·35
Peroxide of iron	20·72
Protoxide of iron	3·69
Protoxide of manganese	trace
Lime	4·48
Magnesia	7·47
Water	13·61
Carbonic acid	trace
	99·77

Formula—$(CaMgFe'')_3\ (AlFe''')_4\ Si_6O_{21} + 7H_2O$.

Specific gravity, 1·76.

SECTION D.—BIOLOGY.

Department of Zoology and Botany.

On the Stipules of Spergularia marina, by Prof. Alexander Dickson, M.D.—As is well known, certain genera of *Caryophyllaceæ*, of which *Spergularia* is one, are distinguished by the presence of stipulary appendages. On examining lately the stipules of *Spergularia marina*, I was struck with a peculiarity presented by them, which, if observed at all by descriptive botanists, has not received the attention it deserves on account of its remarkable character. The stipules are free from the petioles and wholly cellular in structure. From connation of those of opposite leaves they form interpetiolar stipules with more or less regularly, though slightly bifid, extremities. Lastly (and this is the important point), these stipules are united to each other round the backs of the petioles, so that a sheath is formed completely surrounding the axis and the two leaf-bases. This connation of stipules round the backs of the petioles is very interesting as being a rare phenomenon. Cases are not uncommon where the two stipules are connate on the inner side of the leaf-base, constituting the so-called "axillary stipule," *e.g.*, *Potamogeton lucens*, &c., or on the opposite side of the axis from the leaf, *e.g.*, *Ficus elastica*, *Ricinus*, *Astragalus alpina*, &c., constituting the "oppositifoliar" stipule; but the only reference to connation behind the leaf-base I can find is in the case of certain *Astragali*, by St. Hilaire, in his *Morphologie*. In those species of *Astragalus* which I have examined I have not seen any one in which the stipules are actually connate in this way; but in some, *e.g.*, *A. alopecuroides*, the bases of the stipules extend round the back till they meet—a condition just short of connation. In *Spergularia*, as we have seen, we have the interesting combination of the interpetiolar connation with connation round the back of the leaf. In *English Botany* I observe that the condition is fairly enough represented by the artists, but, as I have already indicated, the morphological peculiarity does not seem to have impressed itself on the botanical mind.

Dr. Bayley Balfour remarked that a good deal of confusion existed as to the application of the term stipule, and showed that in some cases it was applied to structures of very different

[1] *Quart. Journ. Geol. Soc.*, London, May, 1872.

appearance, and perhaps even of varying morphological significance.

On the Inflorescence of Senebiera didyma, by Prof. Alexander Dickson, M.D.—When at Plymouth last August during the meeting of the British Association, I took the opportunity of examining *Senebiera didyma*, a weed which grows in great abundance on road-sides and waste places about the town, and I was much struck with a remarkable peculiarity to be observed in connection with its inflorescence.

The inflorescence is like that of the mass of cruciferous plants, racemose. The racemes are "oppositifoliar," and at first sight the arrangement seems to be analogous to that of the oppositifoliar inflorescences of *Vitis* or of *Alchemilla arvensis*, where the inflorescence is really terminal, but thrown to the side by preponderant development of a "usurping shoot," the axillary bud of the last leaf produced by the primary axis before ending in the inflorescence. This view seems further supported by the fact that of all the foliage leaves, that opposite the raceme is the only one apparently destitute of an axillary bud, which on the supposition would be represented by the "usurping shoot." If, however, the plant is more closely examined, a very remarkable condition is disclosed, one, indeed, which offers a morphological problem of considerable difficulty, and which, probably, can be effectually solved only by developmental study. The peculiarity consists in the constant occurrence of a solitary flower springing somewhere from the internode below the raceme either about half way down towards, or almost close to the level of the leaf below. So far as my observations go, the solitary flower is never quite as low as the level of the lower leaf. It might be supposed that from almost immediately above the second last leaf of the main axis, the bases of the terminal raceme of the "usurping shoot," and of the axillant leaf of that shoot had all become fused together. Now, although cases are known on the one hand, of adhesion between the base of a terminal flower and that of the usurping axis (*e.g.*, *Helianthemum vulgare*, Payer), and, on the other hand, between the base of an axillant leaf and that of the usurping shoot in its axil (*e.g. Sedum*, sp. Payer), we do not know of connation of all three together. It is possible, but I think improbable.

The view which, after careful consideration, occurs to me as most fully satisfying the conditions of this remarkable case, may be stated briefly in categorical form as follows:—

1. The racemose inflorescence is terminal and properly begins just above the level of the "second last" leaf. It would thus include the aforesaid solitary flower.

2. The raceme, after producing one ebracteate flower, produces at its second node a foliage leaf from whose axil the "usurping shoot" springs.

By such an explanation we can dispense with any cumbrous adhesion hypothesis such as I have indicated above. The peculiarity is that the main axis does not, *per saltum*, pass from the condition of a leafy axis to that of an axis of inflorescence, but begins by producing one flower and then developing a foliage leaf beyond which the series of flowers is uninterrupted. The "usurping shoot," as above indicated, represents the axillary bud of the foliage leaf by which the raceme is interrupted.

On the 6-celled Glands of Cephalotus and their Similarity to the Glands of Sarracenia purpurea, by Prof. Dickson.—Dr. Dickson pointed out that the peculiar 6-celled glands found on the external surface of the pitcher, both surfaces of the pitcher-lid, and both surfaces of the foliage-leaf of *Cephalotus* are very nearly identical in structure with the glands on both inner and outer surfaces of the pitcher of *Sarracenia purpurea*, which were originally described by August Vogl. Dr. Dickson suggested that the remarkable resemblance in this respect, taken in connection with certain correspondence in the details of the insect-trapping apparatus might suggest an affinity not hitherto suspected.

Exhibition of Plants of Isoetes echinospora.—Dr. Dickson exhibited specimens referable to this species which he lately found growing on muddy bottom among Potamogeton in about two feet of water in Loch Callater, Aberdeenshire. The plants were remarkable for the very slender and tapering character of the leaves which curve outwardly. The spores are very markedly echinate, and in diameter about one-fourth smaller than those of *I. lacustris*.

Dr. Moore, Glasnevin, exhibited remarkable specimens of an Isoetes from Lough Bray, co. Wicklow. They were of great size, much above the average of specimens of *I. lacustris*. Prof. Suringar and Prof. M'Nab suggested that it might be the same as the Italian species known as *Isoetes malinverniana*.

Mr. Britten exhibited, on behalf of Mr. J. H. A. Jenner, specimens of *Rumex maximus*, Schreb, from a new locality on the Cuckmere River, East Sussex. The specimen sent showed the various characters by which *R. maximus* can be distinguished from *R. hydrolapathum*, the species with which it has been confounded.

Dr. Bayley Balfour exhibited, on behalf of Mr. Sadler, specimens of *Salix Sadleri* and *Carex frigida* obtained at the beginning of August in Corrie Chandler, Aberdeenshire. These plants were discovered in 1874 by Mr. Sadler, and have not been met with again until this year.

Notes on Naiadaceæ, by Dr. Bayley Balfour.—Dr. Balfour more particularly described some of the peculiarities observed by him in the genus Halophila, an extremely interesting tropical phanerogamous plant.

Dr. Price, of Chester, sent for exhibition portions of the leaves of *Cardamine pratensis* producing numerous gemmæ.

On the Supposed Radiolarians and Diatomaceæ of the Coal-Measures, by Prof. W. C. Williamson, F.R.S.—Prof. W. C. Williamson called attention to the *Traquariæ* of Mr. Carruthers, found in the lower coal-measures of Lancashire and Yorkshire, with small spherical objects that observer believes to be radiolarians like those still living in existing seas. Prof. Williamson showed that the radiating projections with which these spheres are surrounded were not siliceous spines like those of the Radiolariæ, but extensions of a continuous membrane which enclosed the entire organism, and which therefore could not have the spicular nature attributed to them. He then demonstrated that within this external membrane is a second inner one, which latter is filled with numerous small vegetable cells, like others shown to exist in the interior of fossil spores and reproductive cryptogamous capsules, found in the same beds as those which furnish the *Traquariæ*.

These conditions are so different from those existing in any known recent species of radiolarian as to lead Prof. Williamson to reject the idea of their radiolarian character; whilst their close organic resemblance to some obviously vegetable conceptacles found in the same coal-measures suggest that the *Traquariæ* are also vegetable structures.

The mountain limestone deposits of some British localities contain a vast multitude of minute calcareous organisms which Mr. Sollas and other observers have regarded as radiolarians. These structures, however, seem to exhibit no satisfactory evidence of being so. In the first place these organisms are now calcareous instead of siliceous. It has been suggested that their siliceous elements were removed, and replaced by carbonate of lime, but this appears to be most improbable.

Prof. Roscoe and Prof. Schorlemmer agree in stating that they would require overwhelming evidence before they would be prepared to accept such an explanation of the present condition of these objects or of the fact of the substitution of carbonate of lime for silica, that such an explanation renders necessary.

Count Castracane has published an account of a process by which he reduced numerous specimens of coals to very minute quantities of coal-ash, and has stated that he found in these ashes numerous marine and fresh-water diatomaceæ. Prof. Roscoe kindly allowed one of his ablest assistants in his laboratory at Owens College to prepare analyses of a number of coals according to Count Castracane's method. The residual ashes of these preparations have been mounted microscopically by Prof. Williamson, and in no one of them can a trace of a diatom be found. Beyond stating the fact he is wholly unable to account for the discrepancy between his results and those of the Italian observer, so far as his present observations go, he finds himself compelled to conclude that we have no proof of the existence of radiolarians or of diatomaceæ in the British carboniferous rocks.

A short discussion ensued, in which Sir Joseph Hooker, Prof. M'Nab, and Dr. Bayley Balfour took part, the views expressed coinciding generally with those of Prof. Williamson.

On the Association of an Inconspicuous Corolla with Proterogynous Dichogamy in Insect-fertilised Flowers, by Alex. S. Wilson, M.A., B.Sc.—The majority of conspicuously-coloured flowers whose cross-fertilisation depends on their being easily seen by insects, are proterandrous. Such plants have their flowers placed in close inflorescences, as, for example, in Erica, Calluna, Vaccinium, Digitalis, Linaria, Gladiolus, &c., and occasionally the flowers are secund, or placed on one side of

the axis, thus becoming more conspicuous. In the indefinite mode of inflorescence the older flowers are placed at the lower part of the flowering axis; hence in the commonest form of inflorescence with proterandrous flowers, the lower flowers are in the second or female stage at the time when those in the upper part are in the first or male stage. In proterogynous dichogamy with indefinite inflorescence, the older flowers are in the second or male stage when the upper and younger flowers are in the female stage. In *Scrophularia nodosa* we have a plant in which proterogynous dichogamy is associated with an *inconspicuous* corolla. The stigma after fertilisation is removed out of the pathway to the nectar by the bending back of the style on the outside of the corolla, while the stamens straighten out to occupy the place formerly held by the stigma. The corolla is small and obscurely coloured, being greenish, tipped with brown. The inflorescence is lax, and the flowers scattered all round the axis. The odour of the flowers and the presence of a nectariferous gland shows that the plant is fertilised by insects, and not by the wind. Among such inconspicuously-coloured flowers, proterogynous dichogamy seems to prevail, just as proterandry is characteristic of brightly-coloured flowers. Hitherto it has not been shown how an entomophilous plant could advantageously possess a small uncoloured corolla, and be proterogynous. Watching the mode in which wasps visited the *Scrophularia nodosa* afforded the solution of the problem. The first flower visited by the wasp was the top one, and it passed irregularly downwards from flower to flower, and left the inflorescence by the lowest flower. Bees, when collecting honey, do the reverse, visiting the lowest flower first, and proceeding from flower to flower in regular succession from below upwards, leaving by the top flower. The order in which the flowers are visited is therefore of the greatest importance. In Gladiolus, for example, the bee begins at the lowest flower, and will deposit any pollen brought by it from a neighbouring spike, and as it passes upwards, it will get from the *upper flowers*, a fresh supply of pollen to apply to the lower flowers of another spike. In *Scrophularia nodosa* the wasps, which are less highly specialised as honey collectors, chiefly visit the flowers and proceed from above downwards, leaving the inflorescence with pollen from the lower flowers to apply it to the stigmas of the proterogynous upper flowers.

Wasps differ from bees in one important point, viz., that while bees are purely vegetable feeders, wasps add to a vegetable diet by preying largely on insects smaller than themselves. Throughout the animal kingdom carnivora are endowed with keener powers of vision and scent than vegetable-feeding creatures. That keenness of vision which enables a wasp to descry its prey at a distance, aided by its acute sense of smell, in all probability also enables it to discover these obscure flowers, without the guidance afforded by a coloured corolla, the materials that would be required for its production being employed more economically by the plant, just as in cleistogamic flowers. The wasp also gains an advantage, as it has a better chance of finding honey in these obscure flowers on account of their being easily overlooked by insects less highly endowed as regards powers of scent and vision.

Notes on Dimorphic Plants, by A. S. Wilson, M.A., B.Sc.—The author pointed out that *Erythræa centaurium* was probably dimorphic, as it exhibited heterostyly, and had two kinds of pollen-grains. *Silene acaulis* was shown to have three kinds of flowers, male, female, and hermaphrodite, thus resembling *S. inflata*, which Axel has shown to be tricciously polygamous.

Some Mechanical Arrangements Subserving Cross-fertilisation of Plants by Insects, by A. S. Wilson, M.A., B.Sc.—The plants considered were *Vinca minor*, *Pinguicula vulgaris*, and the foxglove, and the author described the various structural peculiarities in the different flowers.

THE FRENCH ASSOCIATION

AS might have been expected, M. Krantz has been appointed president for the Congress of 1880; but, contrary to all expectation, the decision of the Council who had proposed Algiers as the place of the meeting for 1880 has been altered, and Rheims has been chosen by a large majority. This unexpected vote will create some dissatisfaction in the colony, where great expectations had been raised by the coincidence of the anticipated arrival of the Association and the celebration of the fiftieth anniversary of the conquest.

Dr. Janssen delivered, in the large room of the Sorbonne, a lecture on the present state of physical astronomy, which was completely successful; but it was deeply regretted that no direct news had come of the eclipse and the discovery of Vulcan.

A great *soirée* was given in the Conservatoire des Arts et Métiers, and M. Cornu delivered, in the large hall, an able lecture on Polarisation. The most important part of the display was a series of twenty Jablockhoff lights, exhibited in the gardens. The effect, although splendid, cannot be said to have been better than in the Avenue de l'Opéra and round the Arc de Triomphe.

A banquet of 200 covers was given on Thursday, at the Continental Hotel, to M. Bardoux, the future president of the Montpellier meeting, and present Minister of Public Instruction. On the following evening a great reception was held at the Ministry of Public Instruction, M. Bardoux having opened his *salons*, not only to the members of the Association, but also to the delegates of public schools now visiting the Exhibition at the public expense.

The Paris meeting, however, has been comparatively lost amongst the many special congresses which are taking place without interruption in the Trocadéro, and of which none attracts much public notice. Meteorology had its special congress, holding its sitting at the very same hour when the meteorological section of the French Association was deliberating. Although a large number of influential meteorologists had congregated, none of them could find the means of attending regularly both meetings.

No paper of real importance has been read in any of the sections.

In provincial cities the coming of the Association is always coupled with the inauguration of some public monument, library, museum, schools, &c. No similar ceremony took place in Paris, so that in that respect, as in many others, this thriving Association may be said to have lost a year.

M. Frémy, in his presidential address on soda and steel, traced the history of the improvements in the manufacture of these productions during the past century, showing that at every important stage science stepped in and pointed out the direction which practice ought to take in order to secure progress and success. Science was always at her post, ready to solve, to the advantage of industry, all the problems proposed to her. In showing the important services that science has thus rendered to industry and to the country, he wished to prove that in supporting men of science, by encouraging scientific production, we give to the country natural forces and accomplish a patriotic act. Blind and egoistic spirits have dared to say that science has no need of encouragement, that the true man of science forms himself all alone, that he knows how to triumph over obstacles, that the difficulties which he meets with are necessary trials which only arrest mediocrity, and that he who stops by the way, wanting the scientific inspiration, deserves his fate. Such affirmations are only maintained by those who have not known the difficulties of the scientific career, and who often owe their advancement to favour. We could, alas! cite many examples which prove that the most ardent and courageous man of science may be arrested in his labours by invincible obstacles. M. Frémy then referred in warm terms to the many generous individuals who in France have come to the aid of scientific research, and at the same time said it would be unjust not to recognise all the efforts which have been made in recent years by the state to maintain in France the higher scientific studies. Magnificent and well-endowed laboratories, new scientific chairs, the school of higher studies—these are some of the services rendered by the French government to science. But it is necessary to attract to these laboratories men who are capable of making good use of them, men who really possess the vocation for scientific research, and to prepare a scientific generation to succeed the present. M. Frémy then showed that the French Association might help greatly in promoting this service to science.

PROF. HAECKEL ON THE DOCTRINE OF EVOLUTION

ON Thursday, August 28, a banquet was given to Prof. Haeckel, at the Grand Hotel, Paris, by a number of his admirers, on the occasion of his presence at the Paris meeting of the French Association. A congratulatory address was delivered in the name of the Reception Committee by M. Jules Soury, one of the Staff of the National Library, who said